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favorable conditions for the survival of any new forms that appeared just as many mutations would have been found as in the above experiment. In the light of these results we can attribute the origin of mutations only to chance, since hybridization as a causal agent does not occupy a privileged position relative to the effect.

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LINKAGE AND SEMI-STERILITY

THE Florida velvet bean (*Stizolobium deeringianum*) has normal pollen and embryo-sacs; it flowers (when sown in May) early in September; and has pigmented (mottled) seed-coats. The Yokohama bean (*Stizolobium hassjoo*) has also normal pollen and embryo-sacs; it flowers in July; and has its seed-coats unpigmented. The first-generation hybrids of Florida by Yokohama had half their pollen and embryo-sacs aborted (1, 2); flowered at the end of August; and had more or less pigmented seed-coats. In the second generation, half of the plants had normal pollen and embryo-sacs, and half showed semi-sterility (1, 2). These plants flowered from July to September, the majority being late. About three-quarters had pigmented seed-coats; and one-quarter, colorless seed-coats.

Most of the semi-sterile plants, and also most of the plants with pigmented seed-coats, were late in flowering. The semi-sterile plants, however, were not later than the fertile, in the second generation of the *Florida by China* cross. Hence there is no necessary connection between semi-sterility and lateness. A random sample of five second-generation plants of the Florida by Yokohama cross gave one family with pigmented seed-coats, one family with colorless seed-coats, and three families segregating into pigmented and colorless in about the ratio 3:1. Hence the pigmentation of the seed-coat is not a mere physiological consequence of lateness, but is determined by a definite factor. If *K* is the factor from the Florida concerned with semi-sterility; *P*, a factor concerned with pigmentation of seed-coat; and *H*, the main factor for lateness; then *K* and *H* are strongly coupled in the gametes of the first-generation plants, as are also *P* and *H*. *K* and *P* show secondary coupling.

The data follow.

SEMI-STERILITY AND LATENESS

Second generation of Florida by Yokohama
Seeds sown early in May
(Classes are approximately fortnights)

	1	2	3	4	5	6	Totals
Fertile plants	14	29	19	7	5	7	81
Semi-sterile plants	6	10	11	29	10	9	75

The average of the semi-sterile is about a fortnight later than that of the fertile. If we divide the plants into those flowering before and after August 11, we have:

	First Month	Second and Third Months
Fertile	43	38
Semi-sterile	16	59

A calculation, based on the hypothesis used for semi-sterility (1), shows that the crossing-over (3) between K and H is probably less than 17 per cent.

SECOND GENERATION OF FLORIDA BY YOKOHAMA

Seeds sown early in June

	2	3	4	5	6	Totals
Fertile	7	24	33	5	8	77
Semi-sterile	4	17	28	14	25	88

The fertile plants are earlier than the semi-sterile; though the average difference is less than in the early planting, because, as usual, the first-early plants are more affected by late planting than are the later plants.

PIGMENTATION OF SEED-COAT, AND LATENESS

Second Generation of Florida by Yokohama
Early sowing

	1	2	3	4	5	6	Totals
Unpigmented seed-coats	16	18	6	0	0	1	41
Pigmented seed-coats	4	22	25	35	14	12	112

Thus most plants with unpigmented seed-coats are early. A calculation again shows that the amount of crossing-over is probably under 23 per cent.

SECOND GENERATION OF FLORIDA BY YOKOHAMA

Late sowing

	2	3	4	5	6	Totals
Unpigmented seed-coats	8	20	12	1	2	43
Pigmented	3	21	46	17	31	118

This confirms the results from the early sowing.

PIGMENTATION OF SEED-COAT AND SEMI-STERILITY

The coupling between *K* and *P* is given from the following:

SECOND GENERATION OF FLORIDA BY YOKOHAMA

	Unpigmented	Pigmented	Totals
Fertile	45	110	155
Semi-sterile	39	120	159

The excess of pigmented semi-sterile and of unpigmented fertile testifies to a slight coupling, and calculation shows that there is probably about 35 per cent. of crossing-over.

According to the hypothesis (1), fertile second-generation plants should be mainly homozygous for *H* (or *h*) and *P* (or *p*); while semi-sterile plants should be mainly heterozygous for these factors. This is being further tested.

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